Comments on EPA's October MOBILE6 Workshop and Related Reports

For: American Automobile Manufacturers Association

By: Air Improvement Resource, Inc.

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Introduction

In early October, EPA held a two-day workshop on the development of MOBILE6. During the workshop, EPA presented information on how it intends to change MOBILE5. Shortly after the workshop, EPA released a series of technical reports on subjects presented at the workshop. AAMA attended the workshop, and has reviewed the materials presented at the workshop and the subsequent reports. This document summarizes AAMA's comments on the workshop presentations and materials, and also the reports.

I. Exhaust Emissions Due to Engine Starts

This section reviews the materials presented at the workshop, and also two other EPA reports related to start emissions:

1. M6.STE.002, "Coefficients for the Determination of Engine Start and Running Emissions from FTP Bag Emissions", September 30 1997, and
2. M6.STE.003, "The Determination of Start Emissions as a Function of Mileage and Soak Time for 1981-1993 Model Year Light-Duty Vehicles", also September 30, 1997.

As noted in earlier comments on MOBILE6, AAMA supports EPA's approach of separating start and running emissions. This is consistent with the way EMFAC7G handles start and running emissions. Our comments on the start emissions methodology and the above reports are as follows:

<u>Basic Cold Start Emissions</u> – EPA's materials show cold start HC, CO, and NOx emissions for 1981-1993 vehicles, but not for Tier 1 and LEV-type vehicles. How does EPA intend to estimate cold start emissions for Tier 1 and LEV-type vehicles?

Typically, emissions are reduced by the ratio of the standards. For example, Tier 1 HC cold start emissions could be estimated from the Tier 0 cold start HC emissions and the ratio of the Tier 1/Tier 0 standards (0.25 NMHC/ 0.39 NMHC). This may work for HC and NOx, but for CO the CO standards of Tier 1 vehicles and LEVs are equivalent to the Tier 0 standards (3.4 g/mi). And yet, AAMA would expect that the CO cold start emissions of Tier 1 vehicles and LEVs would be significantly lower than for Tier 0 vehicles. AAMA suggests that EPA use its certification data and ARB's certification data, and EPA's correlation of FTP to hot running emissions to predict cold start emissions from Tier 1 and LEV-type vehicles.

<u>Effects of Cold Temperature on Start Emissions</u> – EPA is proposing to use the MOBILE5 Bag 1 temperature correction factors to adjust start emissions for soaks 12 hours or longer; to use the Bag 3 temperature correction factors for start emissions for soak periods 10 minutes and shorter; and to linearly interpolate between these temperature correction factors for the intermediate soak periods. EPA is further proposing to use the MOBILE5 Bag 2 temperature

correction factors for running emissions.

EPA's temperature correction factors are based on FTP testing using a minimum 12-hour soak. Examination of the temperature correction factor database shows that the latest model year vehicles tested are 1987, which are now ten years old (see Attachment 1). AAMA realizes that EPA may have to use these factors for MOBILE6, because of the lack of temperature test data. However, the Bag 1 temperature correction factors may not be appropriate for cold start emissions, because Bag 1 includes a certain amount of "stabilized" operation. EPA's use of Bag 3 temperature correction factors is probably appropriate for very short soak periods (i.e., less than 15 minutes long). Finally, EPA's use of the Bag 2 temperature correction factors for running emissions is probably appropriate.

AAMA's and EPA's analysis of emissions data at normal summer temperatures (i.e., 75 ^{0} F) shows that later model Tier 0 vehicle (i.e., 1990-1993) generally have much lower emissions than cars and light duty trucks built in the 1980s. These vehicles probably also have less emissions sensitivity to variations in temperature. AAMA believes that EPA's approach of separating cold start and running emissions creates a significant need for further temperature testing, both on later model year cars and light duty trucks, and with a different test procedure. New testing should use a test procedure that incorporates a cold start and no start, similar to EPA's test program which it conducted to determine emissions from a hot running 505 (HR505). In addition, there is a need for data at different temperatures at intermediate soak periods, for example, 30 minutes, 1-hour, 3 hours, etc.

Effect of Cold CO Standards – On November 14, 1997, AAMA members met with EPA OMS and AIR, Inc., to discuss changes in the MOBILE5b model that would more accurately reflect vehicle CO emissions at cold temperatures. AAMA's specific comments are contained in the November 14, 1997 AIR briefing entitled "Impacts of MOBILE6 Development on CO Emissions at Cold Temperatures", which was provided to EPA at that meeting. AAMA was pleased with the outcome of the meeting in that it resulted in an agreement to work together to determine model modifications that should be incorporated to best reflect vehicles designed to meet Phase 1 cold temperature CO standards. AAMA is confident that our work efforts can continue and that they will result in model modifications that are technically correct and agreeable to all involved. AAMA would also like to continue work efforts related to Phase II cold temperature standards, should they be required.

AAMA is hopeful that agreed upon changes related to the Phase I standards can be quickly incorporated and that states will be allowed to utilize a model having these revisions in their SIP planning for CO attainment/maintenance. In this regard, we again request that, once the revisions are completed, EPA make the revised model available for the states/municipalities to use prior to release of the official MOBILE6 model. This is critical because the changes result in major reductions in forecasted CO emissions, and will thus have significant implications on possible CO control strategies and costs.

Effect of Soak Period on Emissions – EPA is proposing to use relationships between emissions and soak time developed by California for EMFAC7G to adjust MOBILE6 start emissions for varying start periods. AAMA had a number of comments on ARB's methods and the data used to establish these relationships. These were contained in our comments on EMFAC7G (1). The most significant of our comments was that ARB did not use some of the industry test program data in establishing the relationships for LEVs. This test data is presented in our comments on EMFAC7G. Our recommendation is that EPA review in detail ARB's methodology, and the data used, prior to using the California soak period relationships "as-is."

II. Deterioration in Running Emissions

EPA is proposing to base its deterioration rates on its own FTP data, and data supplied by AAMA, the ARB, and API. EPA is further proposing to use a deterioration model that uses a constant emissions at low mileage, and a constrained linear function through the low mileage point, which is connected to an unconstrained linear function for high mileage. AAMA supports this methodology - and especially the use of all of the FTP data, as opposed to the fast-pass I/M240 data - for this purpose.

Although not mentioned at the workshop, at a later FACA meeting in Washington EPA stated that it was considering the use of the "high-emitter" correction factor, which was used by the ARB Staff to adjust emissions of 1981-1997 model year vehicles (no adjustment was included in EMFAC7g for 1998 and later vehicles equipped with onboard diagnostic systems). ARB felt this correction factor was necessary because the participation rate of their in-use testing program is 25-30%, whereas the participation rate in the I/M pilot program data was about 60%. EPA further stated that it would not use the high emitter correction factors developed by ARB, but it would perhaps use the same data (the California I/M pilot program data) to develop different new high emitter correction factors, by technology, instead of by model year, as ARB had done. AAMA had a number of comments on the ARB high emitter correction factor during the review of the EMFAC7G model (See Reference 1).

AAMA member companies' experience with in-use testing is that owners are not at all reticent to bring their cars in for testing. The AAMA member companies believe they are getting a sample which adequately represents the population, and thus the industry test data does not need to be adjusted with a high emitter correction factor. AAMA requests that EPA describe the method it would use to develop a high emitter correction factor, and make that available as soon as possible.

III. Facility-Specific Speed/Non-FTP Correction Factors and VMT Weighting Estimates

This section reviews the materials presented at the workshop, and also the report released by EPA on September 29, 1997, entitled "EPA's Proposal for MOBILE6 Facility-Specific Speed

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1 See "Analysis of Light and Medium-Duty Emission Rates and Methodologies in EMFAC7G, AIR, Inc. for AAMA, January 30, 1996.

and Non-FTP Correction Factors."

EPA is proposing to use data currently being developed from the testing of in-use vehicles over a variety of driving cycles. This testing has been performed at ATL and EPA. Data collected at the two different sites shows remarkably different sensitivity of emissions to average speed. The ATL data generally showed lower emissions, and a lower emissions sensitivity to the different test cycles. EPA indicated that because of the differences, it would run a correlation program to try to determine the reason for the differences, but also indicated that EPA may base the speed effects for current vehicles in MOBILE6 on the EPA data alone because the ATL data "may be underloaded."

AAMA supports EPA's efforts to conduct a correlation program. AAMA believes the differences between the ATL and EPA data must be thoroughly understood before EPA makes significant decisions about which data to base the speed effects on. EPA did not indicate why it thought the ATL data may be "underloaded". Another possible explanation, which was not addressed at the workshop, is that the EPA data may be in error (or "overloaded"). If the reasons for the differences are not thoroughly understood, EPA should combine the data, but not omit the ATL data without very good reason.

Another issue relates to how EPA plans to use the freeway ramp driving cycle. AAMA understands that EPA intends to develop national weighting factors for different types of roadway operation, and allow users to input these fractions as well. The model would then weight the emissions from the different cycles together. It is not clear, however, whether EPA will also have speed correction factors, which will adjust emissions between the speeds of the different cycles. If EPA plans to do this, then it should develop such speed correction factors from the new data, but omit the data from the freeway ramp cycle. This cycle appears to result in emissions that do not lie on the typical emissions/speed curve (see Figures 1a-1c of the above report).

<u>Facility-type Speed Correction Factors</u> – It is still not clear to AAMA how the facility-type speed correction factors (SCFs) are being developed. Is EPA developing separate SCFs by facility types, or a single SCF curve across the entire speed range? If SCFs are being developed for different facility types, then how will EPA divide the facility types and levels of service? How will high emitters be handled? Will the SCFs for low and high emitters be estimated separately, and then combined by the estimated fraction of low and high emitters?

<u>Effect of SFTP Standards for Tier 1s and LEV-Type Vehicles</u> – EPA is proposing to include the effects of off-cycle aggressive driving through the use of the facility-specific speed correction factors. Thus, the SCFs will include the effect of speed as well as off-cycle effects. How does EPA plan to incorporate the effects of the SFTP rules on Tier 1 and LEV vehicles, using the facility cycle data on Tier 0 vehicles?

EPA estimated the benefits of SFTP rules in its support document to its supplemental

FTP final rule. However, in that analysis, EPA estimated emissions over ST01, REM01 and REP05 from testing over the FTP and US06, along with some Tier 0 vehicle data. This methodology contains a number of assumptions which have not been confirmed with data. Therefore, AAMA does not recommend that EPA use this methodology in MOBILE6 without a thorough review of it appropriateness.

Likewise, how does EPA plan to estimate these factors for LEVs with and without non-FTP controls? ARB assumed that the impact of non-FTP driving on LEV emissions was the same in relative terms as for Tier 1 vehicles in EMFAC7G. In its supporting analyses for its proposed non-FTP standards, ARB also estimated the impact of non-FTP driving on LEV emissions both with and without SFTP controls. However, as was the case above, this methodology involves many unconfirmed assumptions. Also, the technology assumed by ARB to enable compliance with the non-FTP standards (i.e., rich-bias) is not likely to be the technology of choice for most manufacturers. Therefore, AAMA again recommends that EPA publish the details of any methodology which it plans to use to estimate LEV emission impacts for public comment prior to its incorporation into MOBILE6.

IV. Air Conditioning Effects

EPA Simulation Method - EPA proposed to base its estimate of the impact of A/C use on in-use emissions on the results of its facility specific driving cycle testing which utilized the EPA A/C simulation method. AAMA believes that EPA is using an untested and potentially biased metric to estimate the in-use emissions impact of A/C usage. No A/C simulation technique, including EPA's, has been shown to adequately correlate with A/C emissions in a full environmental chamber for a wide variety of vehicles. Also, the correlation work which has been performed to date has only included testing over SC03 and Bag 2 of the FTP. Correlation over the facility-specific driving cycles used by EPA has not been attempted, nor demonstrated. Correlation could easily be cycle dependent.

There also appear to be technical problems in performing this simulation consistently. While EPA has yet to perform a detailed comparison of the test results at ATL and EPA laboratories, the ATL lab appears to produce much lower A/C emission impacts than the EPA lab. During its presentation at the MOBILE6 workshop, EPA staff indicated a bias towards accepting the EPA testing over that performed by ATL, even though the same cycles and A/C simulation procedure were used in both labs. Without correlation testing against emissions measured in a full environmental cell, it is premature to choose between the two test sites. In fact, the ATL testing shows more consistency with the Phase 3 manufacturer testing conducted at AC Rochester and Chrysler for NMHC, CO and CO2 emissions than the EPA testing. It is difficult to tell which lab is more consistent for NOx emissions, due to the range of impacts found at Chrysler and AC Rochester test sites.

Adjustment for Ambient Temperature and Humidity - EPA proposed to assume that the A/C emission impacts were proportional to compressor usage. However, the actual load which the compressor places on the engine can vary with both temperature and humidity. AAMA has and continues to recommend that EPA perform testing at some intermediate point to demonstrate that its assumption is sufficiently valid for use in MOBILE6.

EPA also proposed to use the heat index to correlate A/C compressor engagement with ambient conditions. Phoenix generally has a low relative humidity. Therefore, use of a heat index to correlate compressor engagement will increase the level of A/C compressor usage in most other areas of the country compared to a correlation based solely on temperature. At the same time, because the ambient temperatures and humidities occurring in Phoenix are not indicative of those occurring in most U.S. population centers, the range of ambient conditions upon which the correlation is actually based is quite limited. It does not cover the range of temperature-humidity combinations generally occurring throughout the U.S. in the summer. A second concern with the use of a heat index is that it relies too much on humidity, as opposed to A/C usage. A/C systems that are operated in the “recirculation” mode, have initial compressor loads that are dependent on the humidity, but as the cabin humidity drops significantly, humidity is much less a factor, while temperature and solar load continue to be factors. AAMA recommends that EPA obtain additional A/C usage data in a more typical part of the country prior to using a heat index correlation in MOBILE6.

<u>LEVs</u> – EPA did not address how the A/C emission impact for LEVs would be estimated. How will this be done? ARB has made some estimates in this area, but numerous uncertainties are involved which deserve close scrutiny and review.

<u>A/C System Integrity</u> - EPA is assuming that 100% of all A/C systems in-use operate properly. As a vehicle does not require its A/C system to be operating in order to be driven, this is clearly an over-estimate. Older, freon-based systems will be getting more expensive to repair over time due to limits on freon replacement and the subsequent need to substantially modify the system for the replacement refrigerant. AAMA recommends that EPA estimate a factor to represent the percentage of A/C systems in-use which are actually operational. Separate factors based on real data may be needed for Freon and non-freon based systems.

<u>Tunnel Studies</u> - If A/C emission impacts are as large as indicated by recent EPA data, this effect should be showing up in the comparison of measured emissions in tunnels versus emission model predictions. Specifically, tunnel studies should show an under-prediction of NOx emissions at high ambient temperatures. If tunnel studies indicate that current emission models (or preferably draft MOBILE6) are not significantly under-predicting in-use NOx emissions, then there may be a need for more research before A/C emission impacts based on limited, potentially unrepresentative and highly uncertain data are added to MOBILE6.

CRC and others sponsored 5 tunnel studies which were performed in 1995:

- Van Nuys Tunnel, Van Nuys California
- Sepulveda Tunnel, Los Angeles

- Deck Park Tunnel, Phoenix
- Lincoln Tunnel, New York City
- Calihan Tunnel, Boston

The five tunnels studied coupled with the seasons during which the measurements took place cover a wide range of ambient temperatures and vehicle speeds. The average vehicle speed during each run was fairly constant at each site:

- Van Nuys Tunnel: average speed of 42-45 mph
- Sepulveda Tunnel: average speed of 40-49 mph
- Deck Park Tunnel: average speed of 58-62 mph
- Lincoln Tunnel: average speed of 20-30 mph
- Calihan Tunnel: average speed of 14-35 mph

Light-duty vehicles dominated the VMT mix in all cases. NMHC, CO and NOx emissions were measured and compared to EMFAC7F (the two California tunnels) and MOBILE5a (the other three tunnels) predictions using measured VMT mixes and model year distributions. EMFAC7G would have been preferable, as it represents the latest ARB model. However, as EMFAC7G projects even higher NOx emissions than EMFAC7F, if the tunnel studies show that EMFAC7F over-predicts measured emissions, then EMFAC7G would show an even greater over-prediction.

Figures 1-5 show the ratio of measured to predicted NOx emission factors versus ambient temperature for each measurement run performed for the five tunnels. If air conditioning is significantly affecting NOx emissions, the ratio of measured to predicted NOx emissions should increase with ambient temperature.

Of the five 1995 tunnel studies, two show decreasing NOx emissions with increased ambient temperature, while three show increasing NOx emissions with increased ambient temperature. The two studies showing NOx emissions decreasing with temperature (Van Nuys and Phoenix Deck Park) were performed during very hot weather. The lowest ambient temperatures during these two studies were 84^{o} and 87^{o}F, respectively, so A/C use may have been high even at the lowest temperatures encountered. Thus, in total, the five studies are inconclusive with respect to the trend in NOx emissions with ambient temperature.

The other important aspect of the tunnel study results is the comparison of the measured NOx emissions with those predicted by the various emission models. Unfortunately, EMFAC7F was used instead of EMFAC7G in the two California tunnels, the latter containing emission factors much closer to what is expected for MOBILE6. Generally, EMFAC7F projects lower NOx emissions than EMFAC7G, so the comparisons in Figures 4 and 5 can be considered conservative. The MOBILE5 emission projections used to model the three non-California tunnels may be lower or higher than those contained in MOBILE6. Estimates of in-use emission deterioration rates are likely to be lower in MOBILE6, but the consideration of non-FTP driving will increase NOx emissions.

Across all five tunnel studies, only 6 measurements out of 46 found NOx emissions in excess of those predicted by the various models. These comparisons need to be repeated with draft MOBILE6 projections which include updated in-use deterioration rates and non-FTP driving. If the result of the comparisons is still that the models over-predict in-use NOx emissions substantially, then the causes of this over-prediction should be determined prior to application of a large A/C adjustment factor. The A/C adjustment factor may not be the primary cause of the over-prediction. However, the A/C adjustment factor is based on highly uncertain emission test procedures which have only been applied under extreme conditions. Therefore, EPA should be cautious about increasing projected in-use NOx emissions even further when essentially all available in-use measurements indicate (presumably with draft MOBILE6) that these emissions are already being over-predicted.

V. Fuel Effects

Sulfur Content

Reformulated Gasoline - EPA proposed to not apply any sulfur impacts to reformulated gasoline (RFG) areas. This presumes that sulfur levels in the future will not be restricted below that implicit in the Phase 2 RFG standards (i.e., 130-200 ppm). EPA is currently considering sulfur restrictions well below this level in its Tier 2 study, in EPA's In-Use Deterioration Workgroup FACA, and STAPPA/ALAPCO is recommending much lower future sulfur standards for LEVs. AAMA strongly recommends that EPA reconsider this decision and develop an approach that allows sulfur effects to be estimated for both conventional gasoline and RFG areas. This approach does not presuppose any EPA regulatory action, nor does it foreclose any regulatory options.

High Emitters – EPA's proposed methodology emphasizes the distinction between the effect of sulfur on emissions from normal and high emitters. The reduction in the rate of emission deterioration which EPA has proposed for late 1980's and later model year vehicles will dramatically reduce the number of high emitters in the fleet from these model years. The relative importance of distinguishing between normal and high emitters will decrease dramatically with the use of these reduced deterioration rates. Higher in-use emissions due to non-FTP driving and A/C usage do not imply a reduction in catalytic activity. Therefore, these other factors do not compensate for the reduced rate of in-use deterioration.

The bulk of the available data on high emitters applies to "1990 model year technology" vehicles and is included in the Complex Model database. Unfortunately, most of these vehicles also fall into the category of vehicles which will have much lower emissions deterioration in MOBILE6. Therefore, this data may be of limited use in addressing the impact of sulfur on emissions from high emitters of an earlier vintage. Adding the Phase 3 ATL data to the database does little to address this mismatch of model years, as the Phase 3 ATL program was designed to address 1990 model year technology vehicles.

The most straightforward approach to address the impact of sulfur on emissions from these earlier model years would be to simply use the Tech 3 portion of the ARB Predictive Model. High emitter data were included in the underlying database in proportion to its availability. EPA could reanalyze these data and attempt to separate the normal and Tier 0 high emitter effects. However, this may not be an effective use of limited resources, given the ever decreasing contribution of these older vehicles to fleet-wide emissions in the future. While the Tech 3 model only addresses HC and NOx emissions, AIR has recently analyzed the same emission database and developed an analogous model for CO emissions, which could be used to fill this gap.

Were EPA to reanalyze the older vehicle data, AAMA recommends that EPA treat ethers and alcohols as two separate variables in the statistical model. This should improve the accuracy of the model with respect to both oxygenate and distillation properties. In doing so, EPA should also move to a model year approach to segregating vehicles, as was done by ARB, rather than the "1990 model year technology" approach which was dictated by the Clean Air Act for regulatory purposes. This latter approach is more difficult to apply in an emissions model like MOBILE.

Finally, EPA proposed to define a high emitter as a vehicle emitting twice its HC emission standard. This is acceptable for Tier 0 vehicles, since the emission databases used to develop the impacts of sulfur on emissions used this definition. However, a Tier 1 vehicle or a LEV which emits at twice its NMHC emission standard would be a normal Tier 0 emitter and would not be expected to show the reduced sensitivity to sulfur associated with a high Tier 0 emitter. AAMA strongly recommends that EPA define high emitters in terms of absolute emission levels, as these are most closely associated with the level of catalyst activity present. The reduced sensitivity of high emitters to sulfur is directly associated with the relative lack of catalytic activity present on these vehicles.

<u>Statistical Methodology</u> - EPA stated in their workshop presentation that they had investigated a number of regression techniques and that regressing absolute emissions versus the logarithm of sulfur content (in ppm) gave the best fit. What were the other techniques which EPA attempted to use? Why did EPA reject the technique that it and ARB used in developing the Complex and Predictive Models (i.e., regressing fuel parameters versus the logarithm of emissions using a dummy variable for each vehicles)? The studies currently being used by EPA do not all address the same range of sulfur contents. If the measured emission levels at each sulfur content are simply regressed versus sulfur content, the studies which addressed the most extreme sulfur contents could have an inordinate impact on the regression line. This will be particularly true if the vehicles tested in those studies had lower or higher average emissions compared to the vehicles tested in the other studies.

AAMA recommends that EPA publish the details of its attempts to fit alternative models to the data for comment, including use of the Complex Model methodology. Only after this is done can a reasonable review of the analysis be conducted.

Tier 1 and Later Vehicles - EPA proposed basing its sulfur impacts for these vehicles on Auto-Oil Tier 1 vehicle data and LEV data which will be submitted by CRC and AAMA/AIAM members in early December, 1997. AAMA members have submitted additional data to EPA indicating the effect of sulfur on Tier 1 and later vehicles. AAMA recommends that this data be included in the MOBILE6 analyses, as well as that data which was already submitted to EPA.

Oxygen Content

EPA proposed to use its CO emission model which was developed subsequent to the Complex Model, but using the same emission data and many of the same statistical tools. AAMA agrees with API's comments made at the workshop that the development of this model should be open to review and we are willing to participate in this process. At the same time, we recommend that EPA repeat its development of the Complex Model for NMHC and NOx emissions, including all of the emission data now available and separating the effects of alcohols and ethers. This updated model is much more likely to appropriately reflect the impact of distillation properties on emissions, since alcohols have a larger impact on mid-range volatility than ethers. Separate treatment of these two fuel components will allow the model to better distinguish between the effect of oxygen and the effect of distillation on emissions. Given the need to review the development of the CO emission model, the additional effort required to address NMHC and NOx emissions should be relatively small on the increment.

Driveability Index

On November 18, AAMA met with EPA to review data on in-use emissions impacts of variations in driveability index. AAMA recommends that EPA incorporate this data into the MOBILE6 model.

VII. Particulate Emissions (PART6)

EPA is proposing to update PART6 about a year after its release of MOBILE6. EPA further has issued a work plan for a contractor to compile a light duty gasoline vehicle database, and to review the EMFAC7g methodology for estimating deterioration in PM emissions from heavy-duty vehicles.

There is at least one CRC test program currently underway that EPA should utilize in its update of MOBILE6. The CRC E-24 project is testing a number of cars (both gasoline and diesel) in Denver, San Antonio, and LA. Test results should be available after the first of the year. CRC is also considering funding some work with the state of Colorado, which will evaluate aggressive driving effects on PM. This testing program will utilize either the US06 or REP05 cycle. Results will be available around the end of 1998.

With respect to heavy-duty vehicles, AIR reviewed the EMFAC7G approach for EMA as a part of the EMFAC7G review. AIR had a number of issues with the EMFAC7G methodology (2). In particular, this method was based on a report and analysis conducted in the middle 1980s, that made assumptions about technology that are not in-use today. At a minimum, if EPA plans to use that methodology, AAMA strongly believes that the whole method needs to be revisited with updated assumptions for heavy-duty vehicle emissions control technology. A reasonable alternative would be to leave PM deterioration in the model where it is for MOBILE5.

With respect to the eventual release of PART6, AAMA believes that detailed EPA guidance is necessary with respect to how any model that forecasts PM emissions is used. Presently, we do not know the extent to which exposure to PM may cause adverse health effects. If PM does cause adverse health effects, the specific control measures for PM would be dependent on the components of PM that are responsible for health effects. This is currently not known. Therefore, there is no assurance that reducing PM emissions from any specific source, e.g., motor vehicles, will have any beneficial effect on health. States need to be informed about the ongoing and future near- and long-term research that is being done to help resolve the PM/health issue, along with EPA timing for the next PM criteria review, nonattainment designations, SIP submittals, etc. States also need to know that new research results may lead to different PM NAAQS than those presently in effect. It may be that states need to focus control efforts on meeting the PM_{10} NAAQS (which also includes fine particulate matter) and not prematurely make assumptions with respect to what EPA future control requirements might be for fine particles. This is a complex issue, and we would urge EPA to provide an adequate discussion of, and guidance on, this issue as an integral part of any future release of the PM model.

VIII. Diurnal and Resting Losses

This section incorporates comments on the workshop materials and on the report M6.RTD.001 entitled “Evaluating Resting Loss and Diurnal Evaporative Emissions Using RTD Tests”, October 8, 1997.

In the workshop and in the above report, EPA addresses how it will estimate diurnal and resting loss emissions for vehicles (cars and light-duty trucks) that are parked (i.e., not operated) for one day. EPA did not address diurnal and resting loss emissions from vehicles that are driven during the day (i.e., partial diurnals), or vehicles that are parked for more than one day (i.e., multi-day diurnals). Also, EPA did not address hot soak, running loss, or refueling emissions from vehicles that either do or do not have onboard refueling vapor control. Finally, EPA did not yet address how it intends to estimate all of these evaporative emission components for vehicles certified to the enhanced evaporative requirements, or subject to onboard diagnostic

2 See “Analysis of Heavy Truck Emission Factors in EMFAC7G, AIR, Inc. for EMA, February 13, 1996.

requirements.

AAMA supports EPA's efforts to base the diurnal and resting loss estimates on all available real time diurnal (RTD) testing. Further, AAMA believes that EPA's division of vehicles by purge/pass status and by leaking status is the appropriate way to model diurnal emissions. With that in mind, the following are AAMA's comments.

Resting Losses - First, AAMA differs with EPA on the characterization of resting losses. The report lists resting losses as due to:

- Permeation of liquid fuel through the fuel system
- Seepage of vaporized fuel at connectors and cracks
- Canister losses, and
- Minor liquid leaks

Basically, AAMA thinks resting losses are the first two categories, but not the latter two. There should be no canister vapor losses at constant temperature, other than permeation through canister walls (which is covered by Category 1). During temperature rises or declines, vapor expansion in the fuel tank and elsewhere results in vapor being sent to the canister. A very small amount of this vapor can escape, because the HC-rich vapor entering the canister displaces some air in the canister, taking along with it some HC vapor that was already resident in the canister. We think of these emissions as diurnal emissions, because they are related to vapor expansion and the diurnal temperature rise. The minor liquid leaks are liquid leaks nonetheless, and probably should be categorized and estimated under "leaking" vehicles.

The reason for going through the above explanation has to do with EPA's assumption that resting losses are a function of RVP. Because resting losses are primarily a permeation phenomenon, AAMA does not believe that resting losses depend on fuel RVP. Rather, they depend on temperature and the types of fuel system materials used. While the data appeared to show some differences in the 6.8 and 9 RVP fuels, we doubt whether the differences are significant. Our recommendation would be for the purpose of estimating resting losses, that EPA should combine all of the test results for different RVP fuels.

24-hour Diurnal Emissions – EPA's approach is to characterize resting losses as a function of fuel RVP and temperature, and estimate total resting losses for the different vehicle tests it has. The 24-hour diurnal emissions are then estimated as the difference in total emissions and resting loss emissions. The resting loss and diurnal emissions for various technologies are presented in Appendix C of EPA's evaporative report.

There are a number of anomalies with the 24-hour diurnal emissions, as shown in Table 1 below.

Table 1. 24-Hour Diurnal Emissions, 82^o-106^o, 9 RVP (g/24 hours)			
Vehicle Group	Fail Purge	Fail Pressure	Pass Purge/Pressure
Pre 1980 Carburetor	69.2	64.2	98.3
1980-85 Carburetor	50.6	44.6	35.9
1986+ Carburetor	13.3	17.2	5.9
1980-85 FI	21.8	40.3	11.7
1986+ FI	20.5	27.0	8.8

For example, the 24-hour diurnal of pre-1980 carbureted vehicles for the 82 to 106 temperatures for vehicles passing the purge and pressure test (98.3 g) is greater than for the same vehicles failing the purge test (69.2 g) or the pressure test (64.2 g). For lower RVPs and temperatures, the opposite is true. Also, the 1986+ FI vehicles appear to be higher emitting than the 1986+ carburetor vehicles. We cannot think of a technological reason why the carburetor vehicles have lower diurnal emissions than fuel injected vehicles, unless these were mostly smaller vehicles with smaller fuel tanks. If this is the case, then it may be a mistake to attribute these emissions to all 1986+ carbureted vehicles.

There are other anomalies. For example, for fuel injected vehicles that pass the purge and pressure tests, at 6.8 RVP the 24-hour diurnal emissions are greater for 72 to 96 (5.37 g) than for the higher temperature range of 82 to 106 (3.221 g). It is difficult to compare many of the values in Appendix C. AAMA recommends that EPA summarize this information in a different format, perhaps graphically, so that these anomalies may be more easily spotted and corrected.

Gross Leakers – EPA proposes to base the fraction of gross leakers on a curve-fit of the fractions of gross leakers in four different samples. The frequency of gross leakers is low at low ages and mileages, but it climbs to 8-10% by age 20-25 years. AAMA recommends that EPA assume that the rate of gross leakers is zero for the first 3 or 4 years. Since the curve seems to accelerate dramatically between 25-30 years, AAMA recommends that EPA cap the rate at between 8-12% for vehicles that are 25 years and older, since there is no evidence of a higher rate beyond 20 years.

In addition to the above comments, AAMA is very interested in how EPA will estimate the other evaporative components mentioned earlier, and also how the travel data will be utilized to estimate evaporative emissions.

IX. Effects of OBD-II Systems in MOBILE6

This section reviews not only the workshop materials, but also the information presented in the report entitled “EPA Proposal for Effects of Onboard Diagnostic Systems (OBD-II) in MOBILE6,” September 29, 1997.

AAMA supports and agrees with the principles outlined in the report above for estimating emission reductions due to OBD-II requirements. In addition, AAMA has three other comments:

First, EPA estimates tampering effects explicitly within the model. The model estimates a tampering effect in g/mi, and adds this to the base emission factor. There are two items included in that tampering rate-deliberate tampering, and inadvertent tampering (malmaintenance). There have been no new tampering surveys in the last few years. AAMA believes that due to the nature of OBD-II, that deliberate tampering with advance technology vehicles will be zero, for most if not all the vehicle's life. In addition, inadvertent tampering should be almost zero, because if vehicles with illuminated malfunction indicator lights (i.e. MILs) are malmaintained (i.e., if inappropriate repairs are made), the light may not go off. Therefore, AAMA further recommends that EPA zero-out deliberate and inadvertent exhaust and evaporative system tampering for vehicles equipped with OBD-II systems.

Second, EPA is proposing to limit the growth of high emitters for the first 50,000 miles because of "50,000-mile bumper-to-bumper warranties." AAMA believes that most bumper-to-bumper warranties are for 3 years or 36,000 miles, and some manufacturers offer the warranties to 4 years and 48,000 miles. EPA may need to re-evaluate this assumption based on a survey of current bumper-to-bumper warranties offered by the largest manufacturers.

Third, EPA is proposing that OBD systems have no effect after 80,000 miles. While owner response to MILs may be less at high mileages than at lower mileages, AAMA believes there will be some owner response to MILs at high mileages (even without an I/M program with an MIL check), and EPA should take this into account (the fraction is not zero). EPA should assume that some fraction of vehicles, which become high emitters after 80,000 miles, would be repaired because of owner response to the OBD-II system. Or, EPA could assume a very high rate of response at low mileages, which gradually declines with higher mileages. If these vehicles over 80,000 miles were subject to and I/M program with an MIL light check, they also would be identified and repaired.

Attachment 1

EPA's Cold Temperature Test Vehicles

(Source: EPA Draft MOBILE Report, Chapter 8, obtained from Lois Platte)